

to Sarangdhar et al. (hereinafter “Sarangdhar”); (iv) rejected claim 9 under 35 U.S.C. §103(a) as being unpatentable over Divine in view of U.S. Patent No. 5,682,554 to Harrell (hereinafter “Harrell”); and (v) rejected claim 13 under 35 U.S.C. §103(a) as being unpatentable over See in view of U.S. Patent No. 5,590,288 to Castor et al. (hereinafter “Castor”).

In response to the final Office Action, the rejections to claims 1-14 are traversed.

With regard to the rejection of claims 1-3, 5-7, 10 and 11 under 35 U.S.C. §102(e) as being anticipated by Divine, Applicants assert that such claims are patentable for at least the reasons that independent claims 1, 5 and 10, from which claims 2, 3, 6, 7 and 11 directly depend, are patentable. The present invention, as recited in independent claim 1, recites a method of processing work items in a data processing system, comprising the steps of: (i) generating an interrupt in response to receipt of a work item in the system; (ii) servicing the generated interrupt to schedule a task for later processing the work item, without re-enabling the interrupt; (iii) subsequently executing the task to process the work item; and (iv) speculatively scheduling a further task for processing of any work items that are subsequently received in the system. Independent claims 5 and 10 recite other aspects of the invention comprising similar limitations.

In response to arguments made in the previous amendment, the Office Action states that the interrupt controller, the instruction register, and the control register of Divine perform speculative scheduling operations, as discussed in column 12, lines 7 to 46. Divine teaches operation speculation predicting jump, branch and load instructions. Claim 1 of the present invention recites a method in which after receiving an interrupt, disabling the interrupt, and scheduling tasks for the work item of the interrupt, a further task is speculatively scheduled for processing any work items subsequently received in the system. As defined by the specification, a task is speculative in nature when the processor is anticipating that further work items will appear on the work item queue while tasks for a first interrupt are executed. Since the interrupt is not enabled when the speculative task is scheduled, work items which are subsequently added to the work item queue do not generate work item interrupts, see, e.g., page 12, lines 11-18 of the specification. Therefore, when the speculative task reaches the head of the task queue, the processor may have work items in the work item queue to process. The method of speculatively scheduling tasks is defined in the specification of the present invention as “polling”, see, e.g., page 4, lines 8-16 of the specification. Thus, a single

interrupt is used and followed thereafter through a polling method.

Divine discloses that when a jump-to-subroutine instruction is executed, the value in the pointed-to-program counter location is incremented, the stack pointer is incremented and the jump address is written to the new PC stack location. Further, the stack of Divine is defined as circular having a set number of entries, in that overflow will overwrite data previously on the stack. Divine does not disclose a system that utilizes a polling method. Divine also does not disclose the interaction of a work item queue and a task queue in the manner of the present invention, while also having the interrupt disabled. Finally, Divine does not disclose a method that adds a task speculative in nature that will reach the head of the task queue and check for work items to process, thus possibly beginning a polling process.

In response to additional arguments presented in the previous amendment, the Office Action also states that an interrupt controller taught by Divine disables the interrupt, as disclosed in column 16, lines 38 to 66 of Divine. This differs from the present invention in that Divine disables interrupts only in response to a specific type of instruction (a JMPS instruction), while claim 1 of the present invention recites the generation of an interrupt and the scheduling of tasks for processing the work item of the interrupt while keeping the interrupt disabled in all cases.

Additionally, Applicants assert that claim 2 of the present invention is patentable with respect to Divine. Claim 2 recites a method of processing work items in a data processing system, comprising: (i) executing the speculatively scheduled task to process any work items received by the system; (ii) on a determination that there are no work items to be processed, enabling the interrupt; and (iii) on a determination that there are work items to process, speculatively scheduling a further task, without re-enabling the interrupt.

Divine does not disclose the execution of a speculatively scheduled task. Additionally, Divine does not disclose that the execution of the speculatively scheduled task results in the processing of any work items received by the system. Further, Divine does not disclose that an interrupt is re-enabled if there are no work items to process, or that a further task is speculatively scheduled without re-enabling the interrupt, if there are work items to process. Claim 2 of the present invention recites the steps taken to determine whether an interrupt-based mechanism or a polling-based mechanism is utilized. The option of an interrupt-based mechanism or a polling-based

mechanism is not presented in Divine. Additionally, the method of deciding which mechanism to use, through speculatively scheduling a task, is also not disclosed in Divine. Accordingly, withdrawal of the rejection to claims 1-3, 5-7, 10 and 11 under 35 U.S.C. §102(e) is therefore respectfully requested.

With regard to the rejection of claims 12 and 14 under 35 U.S.C. §102(e) as being anticipated by See, Applicants assert that such claims are patentable for at least the reasons that independent claim 12, from which claim 14 directly depends, is patentable. Claim 12 of the present invention recites a method of processing work items where an interrupt-based mechanism for processing work items is provided when system utilization is low with respect to work items, and a polling-based mechanism for processing work items is provided when system utilization is relatively high with respect to work items. See discloses a method for suspending operation to read code in a nonvolatile writeable semiconductor memory. More specifically, See discloses steps to determine the time remaining in which to complete operations before the next interrupt occurs. The system disables interrupts while completing operations and polling to determine if interrupts are pending. If an interrupt is pending and the operation has not completed, the operation is suspended and the interrupt is re-enabled. Thus, See seeks to optimize operation completion between interrupts without significantly altering the pattern of interrupts.

Independent claim 12 of the present invention differs from See in that it discloses the use of an interrupt based-mechanism and a polling-based mechanism. While See discloses an interrupt based-mechanism, it does not disclose a polling-based mechanism. See discloses the polling of interrupts to determine if there are pending interrupts, however, this is not a polling-based system as described in the specification. If See finds an interrupt through polling, an interrupt-based mechanism, not a polling-based mechanism, is activated. Further, See does not disclose mechanisms that are dependent on utilization with respect to work items as recited in claim 12 of the present invention. Instead, See discloses an interrupt-based system that seeks to maximize the operation between scheduled interrupts. Accordingly, withdrawal of the rejection to claims 12 and 14 under 35 U.S.C. §102(e) is therefore respectfully requested.

With regard to the rejection of claims 4 and 8 under 35 U.S.C. §103(a) as being unpatentable over Divine in view of Sarangdhar, Applicants assert that such claims are patentable for at least the

reasons that independent claims 1 and 5, from which claims 4 and 8 directly depend, are patentable. The patentability of claims 1 and 5 is discussed above. Accordingly, withdrawal of the rejection to claims 4 and 8 under 35 U.S.C. 103(a) is therefore respectfully requested.

With regard to the rejection of claim 9 under 35 U.S.C. §103(a) as being unpatentable over Divine in view of Harrell, Applicants assert that such claims are patentable for at least the reasons that independent claim 5, from which claim 9 directly depends, is patentable. The patentability of claim 5 is discussed above. Accordingly, withdrawal of the rejection to claim 9 under 35 U.S.C. §103(a) is therefore respectfully requested.

With regard to the rejection of claim 13 under 35 U.S.C. §103(a) as being unpatentable over See in view of Castor, Applicants assert that such claim is patentable for at least the reasons that independent claim 12, from which claim 13 directly depends, is patentable. The patentability of claim 12 is discussed above. Accordingly, withdrawal of the rejection to claim 13 under 35 U.S.C. §103(a) is therefore respectfully requested.

In view of the above, Applicants believe that claims 1-14 are in condition for allowance, and respectfully request withdrawal of the §102(e) and §103(a) rejections.

Respectfully submitted,



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